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| ANALYTICAL APPROXIMATIONS | |
| Volume 15 | |
| Cecil Hastings, Jr. | |
| James P. Wong, Jr. | |
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Analytical Approximation

Chi-Square Integral: To better than .0003 over
 $0 \leq x \leq \infty$ for $m = 8$,

$$F_m(m+x) = \frac{1}{2^m \Gamma(\frac{m}{2})} \int_0^{m+x} \left(\frac{t}{2}\right)^{\frac{m}{2}-1} e^{-\frac{t}{2}} dt$$

$$\doteq 1 - \frac{.4335}{[1 + .05696x + .003877x^2 + .0001708x^3]^4}$$

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Analytical Approximation

Chi-Square Integral: To better than .00035 over
 $0 \leq x \leq \infty$ for $m = 9$,

$$F_m(m+x) = \frac{1}{2^m \Gamma\left(\frac{m}{2}\right)} \int_0^{m+x} \left(\frac{t}{2}\right)^{\frac{m}{2}-1} e^{-\frac{t}{2}} dt$$

$$\approx 1 - \frac{.4373}{\left[1 + .05337x + .003539x^2 + .0001564x^3\right]^4}$$

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Analytical Approximation

Chi-Square Integral: To better than .00035 over
 $0 \leq x \leq \infty$ for $m = 10$,

$$F_m(m+x) = \frac{1}{2\Gamma(\frac{m}{2})} \int_0^{m+x} \left(\frac{t}{2}\right)^{\frac{m}{2}-1} e^{-\frac{t}{2}} dt$$

$$\approx 1 - \frac{.4405}{\left[1 + .0504x + .003234x^2 + .0001462x^3\right]^4}.$$

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Analytical Approximation

Chi-Square Integral: To better than .0022 over
 $0 \leq x \leq 10$ for $m = 10$,

$$F_m(x) = \frac{1}{2\Gamma(\frac{m}{2})} \int_0^x \left(\frac{x}{2}\right)^{\frac{m}{2}-1} e^{-\frac{x}{2}} dt \\ \approx .00016341x^5 - .000041766x^6 + .0000038242x^7 \\ - .00000012258x^8.$$

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Analytical Approximation

Chi-Square Integral: To better than .0016 over
 $0 \leq x \leq 9$ for $m = 9$,

$$\begin{aligned} F_m(x) &= \frac{1}{2\Gamma\left(\frac{m}{2}\right)} \int_0^x \left(\frac{t}{2}\right)^{\frac{m}{2}-1} e^{-\frac{t}{2}} dt \\ &\approx .00060373x^{9/2} - .00016347x^{11/2} \\ &\quad + .000016152x^{13/2} - .00000056547x^{15/2}. \end{aligned}$$

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